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STATUS OF SOUTHERN GULF OF ST. LAWRENCE SCALLOP STOCKS - 1983

by

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ABSTRACT

During the 1983 fishing season, a number of resource surveys similar to what was done in 1982 have been performed on the scallop resource in the Southern Gulf. This allowed more precise mapping of the commercially exploited beds and the discovery of some new beds in district 7C. This document gives the details of results obtained in each surveyed area and analyses the size structure on each major bed. The lack of evidence of significant recruitment in most areas remains worrying and raises some concerns about the future of the southern Gulf scallop fisheries. Due to little feedback from the voluntarily filled log book system, started in 1982, little catch and effort data was made available for analysis. Once again, the need for more precise data on biological cycles makes difficult an in depth analysis of available data. The weakness of the main stocks (Cape Tormentine, Pictou) became evident in 1983 as fishing activity stopped before the end of the fishing seasons.

RESUME

Au cours de la saison de pêche 1983, une campagne d'exploration similaire à celle de 1982 a été menée sur les stocks de pétoncle du Sud du Golfe. Ce travail a permis de préciser la localisation géographique des bancs de pétoncle commercialement exploités et de découvrir quelques nouveaux gisements dans le district 7C. Ce document rend compte en détail, région par région, des résultats obtenus et analyse la structure de taille des différents bancs. L'absence, dans la plupart des régions, de preuves d'un recrutement significatif reste préocupante et soulève une nouvell fois la question de l'avenir de la pêcherie de pétoncle du Sud du Golfe. L'échec relatif du système de carnets de bord volontaires, mis en place en 1982, n'a pas permis de rendre compte avec autant de pr.cision que voulu des problèmes d'effort de pêche. Une nouvelle fois, le besoin de données plus précises sur les cycles biologiques et leurs variations spatio-temporelles s'est fait sentir de façon aigue. La fragilité des principaux stocks (Cap Tourmentin, Pictou) s'est concrétisée cette année par un arrêt de la pêche commerciale avant la fermeture officielle des saisons de pêche respectives.

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Introduction

During the 1982 fishing season, all research efforts were targetted toward establishing a data base for future investigations. Extensive experimental surveys, sampling of commercial catches, recording of fishermen's log books and landing statistics allowed us to better understand the status and distribution of the giant scallop resource in the Southern Gulf of St. Lawrence (including lobster districts 7C, 8 and 7b1). In 1983, we concentrated our efforts on areas considered strategic from the 1982 results and continued developing our data base by surveying a new area.

Most field work involves experimental surveys with some sampling of commercial catches. A long term program of biological investigations was initiated. This includes ageing and the study of the reproductive cycle; the establishment of a quadrat in Nepisiguit Bay, off Stonehaven (NB); a tagging cruise in Baie des Chaleurs; and the setting of an electrofocussing unit for the study of enzymatic patterns.

This report deals exclusively with the appraisal of resource conditions in the southern Gulf of St. Lawrence. Biological aspects will be published separately when analysis are completed.

The scallop fishery in 1983 was quite different from that of 1982. High prices combined with poor catches of other species (herring, flatfish...) and exceptional weather conditions maintained a high level of effort on traditional grounds throughout the fishing seasons. This situation has resulted in poor overall results of the commercial fleet in some of the major fishing areas.

Materials & Methods

Our sampling program was designed as follows:

1 - Sea sampling: much less sea sampling was done this year due to a shortage of manpower. Only three fishing areas were sampled by our staff to appraise commercial catch size distributions: Richibucto, Cape Tormentine and Pictou. All scallops from one bucket from each tow were measured for shell height (hinge to outer margin) to the nearest millimeter. Sampling was also carried out by the sampling section in Pictou and St. George's Bay.

2 - Experimental surveys: (Appendix 1) Seven (7) areas in lobster districts 7C, 8 and 7b1 were surveyed, most of them using commercial fishing vessels locally chartered. Referring to areas as numbered in last year's report (Worms and Chouinard, 1983), the 1983 survey areas were as follows:

1. Nepisiguit - Area 2
2. Miscou east & west - Areas 3 & 4
3. Neguac-Tracadie - Area 5A and part of 5B
4. Richibucto - Area 6 plus part of Area 7
5. Cape Tormentine/Borden - Area 10
6. Pugwash/Wallace - Area 11
7. Pictou - Area 12

(see figs. 1, 3 and 5)

A total of 586 tows were carried out (285, 128 and 173 in districts 7C, 8 and 7b1 respectively) using a five bucket toothed Digby dredge. Each bucket was 50.8 cm wide with 7.5 cm diameter rings. In order to catch small scallops, two buckets were lined with shrimp net of 2 cm stretched mesh. Details on boats are given in Appendix 1. When fishing with a side dragger, we usually operated two sets of drags. All scallops from each tow, including cluckers were measured to the nearest millimeter. Data were kept separate for lined and unlined buckets.

To convert numbers to meat weight, we calculated an average meat count for each area. This was based upon the relationship between shell height and weight of meat (See Appendix II). This relationship was computed from biometrical data collected in 1982. Meat counts for Pugwash and both Miscou east and west were extrapolated from adjacent areas.

3 - Log books: Feedback from log books was rather discouraging as we received 620 log sheets of 1035 last year. The poor return was due in part to the first time use of log books in most areas in recent years (with the exception of the Pictou area). This stresses the importance of the aims of our basic research program.

4 - Official statistics: We had at hand detailed landings by harbour and by month for the period 1967-1981 and statistics by harbour and by week for 1982 and 1983. These results were compiled by year and by statistical sub-districts (see Appendix III).

We will consider 70 mm as a minimum shucking size on commercial fishing boats as was done in 1982. Scallop less than 70 mm, shell height, will be referred to as prerecruits i.e. not available for commercial fishing and/or not suitable for marketing. All estimations of CPUE from our survey data were computed for individuals with shell height 70 mm or more.

Last year, we used a size class interval of 5 mm to be able to compare our results to previous available works. We feel, however, that a smaller interval would better outline the actual size composition of the various samples, especially as we cannot as yet work with age classes for comparison with last year's results, we have again used 5 mm class interval. Details of results for each survey, by square, are given in Appendix IV.

Results

Results will be presented separately for each survey area. Area numbers refer to Figure 1, 3 & 5.

Area 2 - Nepisiguit-Bathurst (fig. 1, Table 1)

Eight (8) squares were surveyed in this area for a total of 79 tows. Size distribution ranged from 32 mm to 148 mm with modes around 85 and 120 mm (fig. 2A). Mean size of scallop over 70 mm was 96.0 mm (Table 2). Percentage of prerecruits was 9.3 of the total catch.

The average CPUE computed from survey data was 1.02 kg/m/h. similar to that computed from log book data (1.12 kg/m/h). Best squares in the survey appeared to be squares 63 with 1.42 kg/m/h (only one record from log books) and 89 with 1.30 kg/m/h (no record from log books). From log books, the best square was #78 with 1.35 kg/m/h (22 records) (Table 3).

Area 3 - Miscou West (fig. 1, Table 1)

Five squares were surveyed in this area for a total of 31 tows. Sizes of survey catches ranged from 30 to 146 mm with a strong mode at 80 mm and smaller ones at 115 and 130 mm. (fig. 2B). Percentage of prerecruits was 7.8% of total survey catches. Exceptional catches (up to 500 individuals for an 8 minute tow with two sets of drag) were recorded in a very restricted area about 6.5 nautical miles off Miscou Center on the 10 fathoms isobath.

Average size of commercial sized individuals was 93.8 mm (Table 2). Average survey CPUE was 1.68 kg/m/h in square 57. We have no log book records from this area as no commercial fishing occurred.

Area 4 - Miscou East (fig. 1, Table 1)

A total of 43 tows were done in this area east of Lameque and Miscou Islands. Sizes of catches range from 28 to 133 mm with a strong mode at 80 mm and another one at 120 mm (fig. 2C). Percentage of prerecruits averaged 8.3%.

Good concentrations were detected especially in square 61 where two tows yielded 277 and 376 scallops respectively. This spot is situated 10 nautical miles east/south east of Miscou gully. Another small bed located 4 nautical miles off Cap Bateau gave good results, although less than the previous area. Both beds are situated on the 15 fathoms isobath.

Average size of commercial size individuals is 94.0 mm. CPUE from survey data was 2.67 kg/m/h in square 61 and 0.95 kg/m/h in square 85.

Area 5 A & B - Shippagan-Miramichi Bay (fig. 1, Table 1)

One hundred and twenty six (126) tows were performed in this area which was surveyed as a single unit (two surveys were done last year). The range of size distribution was 35 to 148 mm with a strong mode at 80 mm and a secondary mode around 120 mm (fig. 2D). Mean size of survey catches excluding prerecruits was 89.7 mm (Table 2). Prerecruits accounted for 7.3% of the catch. The best catches occurred in squares 100 with a CPUE of 1.12 kg/m/h and 121 with a CPUE of 1.40 kg/m/h. The average CPUE for the whole area was 0.70 kg/m/h (Table 1). Poor returns of log books from this area (only 9 records) made it difficult to make inferences from commercial CPUE (see Table 3).

Area 6 - Richibucto (fig. 3, Table 4)

During this survey, we performed 76 tows covering essentially the Richibucto area (#6) surveyed last year and a part of the

Miminegash (#7) and Egmont Bay (#8) areas. Sizes range from 32 to 149 mm in survey catches and from 55 to 136 mm in commercial catches. Both distributions show similar bimodal aspect with a strong mode at 75 mm and a mode at 120 mm in survey catches and 110 mm in commercial catches (fig. 4A). Percentage of prerecruits in survey catches was 12.4%.

Mean sizes of scallops over 70 mm were 87.7 mm for survey catches off Richibucto, 95.9 mm off Miminegash, 90.5 mm off Egmont Bay and 91.8 mm for commercial catches (Table 2) sampled in the Richibucto area.

Average CPUE from survey data was 1.01 kg/m/h with the best results in squares 156 (3.34 kg/m/h), 170 (1.96 kg/m/h) and 153 (1.87 kg/m/h) Table 4 . CPUE as computed from log books (only 53 returns) averaged at 1.45 kg/m/h with 1.73 kg/m/h and 1.87 kg/m/h in squares 153 and 156 respectively (no records for square 170) (see Table 3).

Area 10 - Cape Tormentine (fig. 3, Table 4).

Fifty two (52) tows were done in this area, concentrating on the three most heavily fished squares (#227, 228 and 243). Size distributions for both survey and commercial catches were unimodal with modes at 90 mm and 95 mm respectively (fig. 4B). The average size of individuals over 70 mm was 89.8 mm for survey data and 94.1 mm for commercial data (Table 2). Only 4.2% of survey catches were prerecruits.

Results from both survey data and log books show high CPUE values; average CPUE was 1.39 kg/m/h for survey data and 2.08 kg/m/h from log books (based on 63 records, on an estimated 2500 days of fishing, i.e. only 2.5%). Best squares as determined

from survey data were squares 227 (1.50 kg/m/h) and 242 (2.14 kg/m/h) with corresponding commercial CPUE of 2.02 kg/m/h for square 227 (no record from square #242) (Table 4).

Area 11 - Pugwash (fig. 5 and Table 5)

This area had not been explored last year due to difficulties in finding a commercial boat to charter. We succeeded in chartering a boat this year and had an 82 tow survey in this area.

Sizes range from 24 to 138 mm with very few individuals smaller than 70 mm. Most of the individuals captured range between 70 mm and 125 mm. From the size distribution, no definite mode really appears (fig. 6A). Mean size was 99.5 mm. Few prerecruits were found in this area as only 3.2% of the survey catches were scallops less than 70 mm.

Average CPUE was 0.54 kg/m/h with best CPUE found in squares 302 (1.07 kg/m/h) and 301 (0.92 kg/m/h). From commercial data (29 records) average CPUE was 1.64 kg/m/h (Table 5 and 3).

Area 12 - Pictou (fig. 5, Table 5)

Two major beds or group of beds were surveyed:

1) Indian Rocks (fig. 6C)

On this bed 25 tows were performed. Sizes range from 11 to 138 mm. Size distribution shows two small modes at 30 and 50 mm and three other modes at 85, 95 and 115 mm. Mean size of commercial size scallops was 96.3 mm. Prerecruits accounted for 14.2% of survey catches. Average CPUE as determined from survey data was 0.79 kg/m/h in square 285.

2) Pictou Island (fig. 6D)

Major concentrations of scallops are located west and north of Pictou Island. Sixty five tows were done around Pictou Island, yielding 1524 individuals. Sizes range from 22 to 144 mm. Size structure is very similar to the one observed on Indian Rocks bed with modes at 30, 50, 90 and 120 mm. Mean size of survey catches was 95.8 mm and 95.2 mm for commercial catches (Table 2). 17.22% of survey catches were prerecruits.

Average CPUE as determined from survey results was 0.81 kg/m/h with best results in squares 304 (1.04 kg/m/h) and 305 (1.04 kg/m/h) (see Table 5). Results drawn from log books show an average CPUE of 1.45 kg/m/h with 1.30 and 1.65 kg/m/h for squares 304 and 305 respectively (see Table 3).

Landing Statistics (Table 6)

We obtained detailed statistics on scallop landings and landing values from the Statistic Branch. We transformed live weight landings into metric tons of meat using the 8.3 conversion factor. We think the latter is better, reflecting the actual landings as: 1) only meats are landed and 2) the conversion factor of 8.3 used to convert weights of meat into live weight is not accurate for each statistical district (see Worms and Chouinard, 1983).

Prices are presented in dollars per Kilogram of meat. Figure 7 shows the history of both landings and landing values of scallop meat for the period 1967-1983. Landings decreased sharply from a high of 900 t in 1967 to a low of 200 t in 1974. Since 1979 landings have fluctuated between 200 and 350 t.

During the same period, prices increased almost constantly from $0.56/kg in 1967 to $11.80/kg in 1983. It should be noted

that usually an increase in the price paid to fishermen was followed at once by an increase of landings. If the price is good more fishermen will try to make their living in this fishery. The opposite phenomenon occurs when prices are low. This quick reaction of the fishery to price fluctuation is due to the fact that the price level for the coming season is usually known before the start of the season and fishermen organize their fishing season according to this information.

If we examine landing statistics by statistical sub-district (fig. 8A, B and C) the same type of phenomenon appears clearly. Main sub-districts for scallop are:

District 7C- #64 Nepisiguit
#68/70 Val Comeau

District 8 - #76 Richibucto
#80 Cape Tormentine
#82 Miminegash

District 7 - #11 Pictou
#86 Woods Island
#87 Boughton Island

For those districts catches were relatively high in 1981 due to high price ($10.09/kg) and then dropped in 1982 as price paid for scallops was only $7.59/kg. In 1983, the price was excellent ($11.80/kg) and the weather good, so catches went up in most areas except in districts 80 and 11.

Our previous comments on the reliability of these numbers (Worms and Chouinard, 1983) are still of value but one can assume that the bias introduced in the landing statistics is pretty well constant. It is then possible to comment on general trends.

Assuming that one sale accounts for one fishing day, it is possible to have an idea of variations of effort (in term of number of days fished and average meat yield per fishing day from year to year. From table 7 it appears that generally yield increases when effort decreases. This is shown on Table 7A where results are presented for each lobster district. Results are also given for major sub-districts in districts 8 and 7b1 (Tables 7 B & C). However, in sub-district 80 (Cape Tormentine) despite a sharp decrease of effort, yield went down between 1982 and 1983.

Discussions

Results obtained suggest the following remarks:
1) due to high prices and good weather conditions, number of active licences and number of days fished per active licence were much higher in 1983 than in 1982; consequently,
2) landings increased in most of the statistical sub-districts but in sub-districts 11 and 80 where fishermen stopped fishing far before the end of the official fishing season:
3) during our surveys, we observed a general lack of prerecruits which showed generally much less in our catches than last year.

As we did not use the same fishing gear in 1982 and 1983, it was quite difficult to compare abundances of prerecruits. We finally calculated the number of individuals smaller than 70 mm shell height fished by a meter of lined dredge per hour (ind/m(i.d.)3h) based on the number of prerecruits caught by the lined buckets in each survey. Table 8 gives the results of this calculation.

4) in most of the explored areas, meat counts are much higher in 1983 than in 1982, and
5) CPUE computed from survey as well as from log book returns are generally higher in 1983 than in 1982.

As mentioned above, our efforts were aimed at the most important areas in term of commercial fishing. Thus little work was done on such areas as Belledune (District 7C, survey area #1), Buctouche (District 8, survey area #9) or St. George's Bay (District 7b1, survey area #13) which areas are fished by only a few fishermen and where the available resource appears very limited from last year's survey. For comparison of 1983 results with those of 1982, we will refer to our last year CAFSAC report (Worms and Chouinard, 1983).

In 1982, the Nepisiguit area was found to have a small but healthy stock with good prerecruitment. This year, the geographic repartition of the beds looks the same but we observe the disappearance of the 50 mm mode, and the occurence of a stronger mode at 80 mm; the 120 mm mode remains almost unchanged (fig. 2A) resulting in a smaller mean size of individuals over 70 mm in 1983 (95.6 mm) if compared to 1982 (100.0 mm) (Table 2 and Worms and Chouinard, 1983). This raises the problem of future renewal of beds and stability of recruitment from year to year. Table 8 shows a decrease of the number of prerecruits from 39.1 ind/m(1.d.)/h in 1982 to 17.4 ind/m(1.d.)/h in 1983.

Last year's survey around Lameque and Miscou Islands was not too satisfying due to weather conditions and problems with our charter, but one can observe that this strong mode at 70 mm observed in 1982 shifted to 80 mm whereas the 110 mm mode remained unchanged. The same effect on mean size, as mentioned for Nepisiguit area can be observed (see Table 2). As in Nepisiguit, the number of prerecruits found in 1983 is far smaller than in 1982. Some small spots, both east and west of Miscou proved to be of outstanding yield with CPUE as high as 2.67 kg/m/h calculated on 5 tows in square 61 (fig. 1) or 1.68 kg/m/h on 10 tows in square 57. About 10 fishermen from Lameque and Shippagan fished in this area but exclusively east of Lameque

Island(off Ste Marie) in squares 85 and 86. The beds found in squares 61 and 57 were never previously reported and can be considered as unfished at least during the last twenty years.

It is likely that the percentage of prerecruits in the 1982 Miscou survey was largely overestimated due to selection of sampling sites. However, even if 30.1 ind/m(1.d.)/h is too high a number, the 9.6 ind/m(1.d)/h value calculated from the 1983 survey data will indicate a decrease of the population of prerecruits.

The survey performed this year in the Shippagan-Miramichi area covers most of the area 5A and part of area 5B. The 60-65 mm mode, visible in 1982 with a smaller mode at 85, is replaced in 1983 by a very strong mode at 80 mm. Size structure of the Tracadie bed shows a small mode at 45 mm. The 120 mm mode is still present in 1983 though less important than in 1982 (fig. 2C). Geographic position of beds on the bottom is quite similar to that of last year except a new bed with some prerecruits mainly 65 to 68 mm in square 121 (see fig. 1). Number of prerecruits is lower in 1983 (Table 8) dropping from 22.5 ind/m(1.d.)/h to 7.9 ind/m(1.d.)/h. This year, a total of 40 licences fished in this area for an average of 30 days per active licence. We have no data available on 1982 average number of days fished per licence but if an increase of fishing pressure took place in this area this year, it seems to have been much smaller than in most other areas. Catches were stable at 17.7 tons of meat in 1983 (17.6 t in 1982) as the decrease in sub-district 68 was balanced by an increase of landings in the adjacent sub-district 70 (see Appendix III).

In 1983, the Richibucto survey covered the whole area 6 plus part of areas 7 (Miminegash) and 8 (Egmont Bay).

Concerning survey data, the main mode at 70 mm in 1982 shifted to 75 mm in 1983 (fig. 4A). In 1982, secondary modes at 100 mm and 120 mm are replaced by a single 120 mm mode in 1983. Mean size of catches over 70 mm is 90.8 mm (94.7 in 1982). Abundance of prerecruits dropped from 25.8 ind/m(l.d.)/h to 19.4 ind/m(l.d.)/h. Once again, we see a decrease of the amount of prerecruits while CPUE are much higher than last year. The effort increased drastically this year, not in terms of number of active licences but of number of days fished (Table 7).

Cape Tormentine area had been identified last year as a "problem area" (Worms and Chouinard, 1983). If we compare size distribution for both commercial and survey data in 1982 and 1983, they are similar with a slight shift of modal size from 85 mm to 90 mm (fig. 4B). The small 60 mm mode which appeared in 1982 is not present in 1983; this is compensated by the presence of relatively more individuals smaller than 60 mm resulting in a stable number of prerecruits per meter of lined drag per hour (6.4 in 1982 and 7.4 in 1983). Percentage of cluckers was 13% in 1983, i.e. less than what was found in 1982 (16%). Size distribution of cluckers is very similar to the one of live scallops with a single mode at 90 mm. Mean sizes of individuals over 70 mm are almost identical from one year to the other (see Table 2). Last year, good CPUE's were noted in this area. It seems, however, that our last year's concerns were justified as most fishermen stopped fishing two weeks before the end of the fishing season (June 25, 1983) and total catches over the season dropped in sub-district 80 from 46.8 tons of meat to 22.6 tons.

Pugwash-Wallace area, although new to us, did not bring any surprises. Except for some beds south east of the area, near Pictou area (fig. 5), we did not find any commercial concentration of scallops. Overall, this region shows a very low abundance

of prerecruits (2.2 individuals/meter(1.d.)/hour, a mean size of 99.5 mm and low CPUE's even in best squares) (see Table 5).

This area is obviously not favorable for scallop; only a few fishermen fished there and there is no reason for increasing the overall effort.

Last year, we considered the scallop resource in Pictou in good condition although, fragile, due to over-lapping areas of prerecruits and adults.

This year's survey, done in August and October, gave similar results to the 1982 survey:
- good abundance of prerecruits (19.9 ind/m(1.d.)/h in 1983), 18.8 ind/m(1.d.)/h in 1982); the best of all our surveys;
- a stable mean size (95.7 mm compared to 94.0 mm in 1982); and
- the same pattern of repartition of major beds.

During our survey, on Pictou Island bed, 20.5% of scallops caught were cluckers; this is more than what was found in 1982 (11.4%) and could indicate a problem of abnormal natural mortality.

Average CPUE as computed from survey data and from log books was higher in 1983 than in 1982. But yield dropped drastically in September 1983, in such proportion that many fishermen turned to other species or sailed to Cape Breton to fish scallops off Margaree. Nothing indicated such a collapse of the resource and as of yet we have no explanation.

Several elements should be considered:
* as all over the Northumberland Strait, fishing pressure was higher during the 1983 fishing season due to high prices paid for scallop meat;

* very high meat counts (up to 70 meats per pound) were noticed several times, indicating that some fishermen could be shucking almost anything and resulting in the destruction of prerecruits.
* it is difficult to base any conclusion on calculation made using the number of active licences as quoted in Table 9. Officially, a licence will be considered as "active" even if it is fished only a few days in the season. As we have no records of the actual number of days fished for each "active" or so called "active" licence, the number of sale slips is the best estimate of actual effort we have even if it is not really accurate. A fisherman can, for example, pay his helper with scallops. The helper will sell those on his own and this will result in two sale slips for a single day. Some fishermen wait two to three days before selling their catch, resulting in a single sale slip for several fishing days. Other sources of bias have been identified.

Conclusion

This year, we again came to the conclusion that scallop stocks in the Southern Gulf of St. Lawrence are difficult to manage on a long term basis for many reasons:

- The lack of basic knowledge on biological cycles (growth, reproductive cycle..) and population parameters (mortality, recruitment pattern) makes it impossible to explain results drawn from various sampling procedures;

- those parameters are highly variable from one area to the other and one cannot therefore extrapolate survey results;

- amount of fishing pressure that will be put on the resource each year is unpredictable from one year to the other as it is highly dependant upon (a) the price paid to the fisherman,
(b) the weather conditions,
(c) the success obtained on other species;

- control of such a fishery, at any level, is logistically very difficult to enforce due to the number of fishermen and landing sites, the extension of the area of concern and the lack of manpower and boats on the Department's side.

The case of the scallop fishery in Pictou is a good example of how difficult it is to forecast the evolution of a given bed from one year to the other.

Due to socio-economic and logistic constraints, most regulation will be unrealistic in its enforcement. For example, lack of patrol boats makes it impossible to enforce any closure zone.

Two management options look feasible to control the Southern Gulf scallop fishery. These are meat count controls and limited fishing seasons. Fishing season is limited to two months in District 8 and it is likely that without this restriction, the stock condition would be even worse than it is (especially in Cape Tormentine area).

In this area as in others, there is a phenomenon of self regulation of effort as fishermen will stop fishing if yield falls under the estimated level of profitability. A further shortage of the season seems difficult to enforce. However, if the price at the beginning of the regular season is anticipated to be very high, a temporary closing of the season could be enforced to avoid too much effort to be put on the fishery.

A limited fishing season should be established for Pictou in order to decrease the amount of effort. A reasonable proposal will be to open the fishery from April (or whenever water is

ice free) to mid-June, close it between mid-June and end of September and re-open it from 1st of October to ice. This will avoid the heavy fishing in the first two weeks of July and in September (fig. 9). In the spring, most fishermen are fishing lobster and the effort on scallops is rather low except in April.

These remarks lead us to another problem, i.e. the warding of management districts. The type of regulation we propose for Pictou could be unsuited to other areas of District 7bl. The same remark is valid for other districts as well. We look forward to a definition of new management districts dedicated to scallops and based on biological considerations.

Last year we stressed the necessity of having close control of meat counts as being the only way of discouraging fishermen to shuck anything they fish. We feel it is not a way of managing the fishery per se but a rather simple way of having a control on the size range of scallops shucked. It should be noted that this control being "a posteriori", it will be effective only if dissuasive. There should be a legal environment allowing strict enforcement of these controls. In general, we feel the condition of the resource in the Southern Gulf is poor, no area showing outstanding commercial concentrations. Some areas require prompt action (Pictou for example).

We cannot see any way of increasing the number of licences in any area of the Southern Gulf and we think that a regulation of prices from year to year will make things easier for resource managers.

For the next few years, we do not feel it is useful to carry on the same kind of extensive surveys as very little change in the bed locations was observed between 1982 and 1983. Full interpretation of survey results and use of yield models is impossible due to lack of knowledge of population parameters.

Several basic problems will then have to be addressed as soon as possible to allow a better understanding and interpretation of survey results:

1) Gear selectivity and efficiency whose knowledge will allow precise estimates of density and biomass.

2) Recruitment patterns

3) Growth parameters

4) Maturation, spawning timing and fecundity. Those parameters must be well known before being used to interpretate size structure and applying any kind of production model.

From our experience of the last two years, it appears that very little comes out of a voluntary log book. It is our feeling that most fishermen do not really mind filling it but just forget to do so. A week-to-week check up of log book returns should allow identification of fishermen who did not send in their logs. Those fishermen could then be reminded by fishery officers to fill and send it in. This system proves to be successful with other species but does not guarantee the confidentiality of information. It could be the only way of getting good and enough information from a scallop log book system.

Bibliography

Worms, J.M. and G. Chouinard, 1983. Status of Southern Gulf of St. Lawrence Scallop stocks - 1982. CAFSAC Research Document 83/68.

Table 1 - Summary of results obtained from surveys in district 7C.

AREA	Number of the best square	Total # of tows (in best square)	Duration (min)	Number of individuals			% of individuals <70 mm			% of cluckers	CPUE		Estimated fishing performance			
				Lined	Unlined	Total	Lined	Unlined	Total		kg/m/h	lb/ft/h	kg/3.56m/10h	kg/4.60 m/10h	lb/12ft/10h	lb/15ft/10h
Nepisiguit		79	647	1162	1321	2483	16.4	3.3	9.3	14.8	1.02	0.68	36.3	46.6	79.9	102.7
	63	(4)	35	90	95	185	14.4	2.1	8.1	12.3	1.42	0.95	50.6	65.0	111.5	142.3
	89	(5)	42	95	102	197	11.6	-	5.6	13.6	1.30	0.87	46.4	59.6	102.2	131.2
Miscou		80	665	789	835	1624	13.7	3.5	8.4	4.6	0.68	0.46	24.2	31.1	53.4	68.6
	57	(10)	81	210	280	490	14.3	5.0	9.0	30.1	1.68	1.13	59.7	76.6	131.5	168.9
	61	(5)	42	231	167	398	11.7	1.8	7.5	-	2.67	1.79	94.9	121.9	209.2	268.7
Shippagan/		126	995	2210	174	2384	10.5	3.7	7.3	0.8	0.70	0.47	25.1	32.2	55.3	71.0
Miramichi	100	(19)	155	340	237	577	9.4	0.4	5.7	0.7	1.11	0.75	39.7	50.9	87.5	112.3
Bay	121	(29)	232	577	568	1145	14.6	6.3	10.5	0.5	1.40	0.94	49.9	64.0	109.9	141.1

Table 2 - Mean size of scallops fished in each area surveyed in 1983.

	Survey Data		Commercial Sampling Data	
	Total	> 70mm	Total	> 70mm
Nepisiquit	92.5(19.7)	96.0(17.1)	*	*
Miscou	90.8(20.1)	93.8(18.0)	*	*
Shippagan/ Miramichi Bay	87.7(17.0)	89.7(16.0)	*	*
Richibucto	86.9(19.4)	90.8(17.3	88.9(18.6)	91.8(17.8)
Cape Tormentine	88.6(11.6)	89.8(9.9)	93.6(11.0)	94.1(10.4)
Pugwash	98.2(14.8	99.5(13.0)	*	*
Pictou	89.7(20.8)	95.8(14.8)	93.6(14.1)	95.2(12.0)
George's Bay	*	*	91.8(12.4)	93.5(10.4)

1- Number in brackets is the standard deviation

* No data available

Table 3 - Commercial C.P.U.E. computed from log book returns in the Southern Gulf.

Area Number	Square no.	No. of log sheets		CPUE(kg/hr/m)	
		1982	1983	1982	1983
1	47	12	-	0.58	-
	48	32	-	0.72	-
	Total	44	-	0.69	-
2	49	11	3	0.80	1.03
	78	18	22	0.85	1.35
	Total	95	123	0.90	1.12
3	Total	6	1	1.71	0.66
4	-	-	-	-	-
5	99	15	3	0.30	2.14
	113	19	-	1.44	-
	Total	118	9	0.66*	1.36
6	147	39	10	1.35	1.64
	154	44	11	1.17	1.52
	Total	162	53	1.26	1.45
7	156	63	15	1.21	1.87
	162	11	-	1.53	-
	Total	208	15	1.34	1.87
8	Total	35	19	1.50	1.10
9	Total	4	1	1.85	1.38
10	227	59	44	1.78	2.02
	243	5	7	1.83	1.91
	Total	76	63	1.70	2.08
11	Total	6	29	1.29	1.64
12	305	42	27	1.38	1.65
	306	22	39	1.61	1.62
	Total	262	275	1.34	1.45
13	Total	19	32	1.10	1.27
Total		1035	620		

* CPUE does not include scallop roe which was also landed in this area.

Table 4 - Summary of results obtained from surveys in district 8

AREA	Number of the best square	Total # of tows (in best square)	Duration (min)	Number of individuals			% of individuals <70 mm			% of cluckers	CPUE		Estimated fishing performance			
				Lined	Unlined	Total	Lined	Unlined	Total		kg/m/h	lb/ft/h	kg/3.56m/10h	kg/4.60 m/10h	lb/12ft/10h	lb/15ft/10h
Richibucto		76	654	1230	1130	2360	17.6	6.8	12.4	10.2	1.01	0.68	36.0	46.2	79.0	101.5
	156	(4)	34	233	158	391	12.9	2.5	8.7	3.2	3.34	2.24	118.8	152.6	261.2	335.4
	170	(9)	75	250	316	566	31.6	14.2	21.9	23.7	1.87	1.26	66.7	85.6	146.6	188.3
Cape		52	436	790	1406	2196	7.0	2.3	4.0	13.3	1.39	0.93	49.5	63.6	109.1	140.1
Tormentine	227	(21)	171	342	594	936	8.5	1.7	4.2	12.4	1.50	1.01	53.7	68.9	118.3	151.9
	242	(4)	44	126	211	337	4.8	1.9	3.0	11.8	2.14	1.44	76.1	97.6	167.6	215.3

Table 5 - Summary of results obtained from surveys in district 7b1.

AREA	Number of the best square	Total # of tows (in best square)	Duration (min)	Number of individuals			% of individuals <70 mm			% of cluckers	CPUE		Estimated fishing performance			
				Lined	Unlined	Total	Lined	Unlined	Total		kg/m/h	lb/ft/h	kg/3.56m/10h	kg/4.60 m/10h	lb/12ft/10h	lb/15ft/10h
Pugwash		82	647	464	798	1262	5.2	2.1	3.2	6.3	0.54	0.37	19.4	24.9	42.7	54.8
	301	(13)	104	124	223	347	5.6	5.4	5.5	6.0	0.92	0.62	32.7	42.0	72.1	92.6
	302	(9)	72	79	193	272	3.8	2.1	2.6	9.0	1.07	0.72	38.2	49.0	84.1	108.0
Pictou		91	794	1138	1404	2542	24.1	7.0	14.6	17.6	0.81	0.54	28.7	36.9	63.3	81.3
	304	(8)	67	103	162	265	20.4	4.9	10.9	17.4	1.04	0.70	37.1	47.6	81.8	105.0
	305	(28)	242	511	532	1043	26.6	10.0	18.1	20.9	1.04	0.70	37.1	47.6	81.8	105.0

Table 6 - Landings of scallop (kg of meat weight) in lobster district 7c,8 and 7b1 for 1967 to 1983.

	Lobster District		
YEAR	7c	8	7b1
1967	4276	182,599	718,272
1968	3947	1,052,577	273,032
1969	5082	231,743	405,057
1970	69673	298,373	327,917
1971	55444	258,752	265,310
1972	81098	151,032	275,966
1973	45428	112,652	146,861
1974	36567	45,932	119,429
1975	31082	58,083	185,955
1976	25465	217,738	119,446
1977	14927	175,219	60,979
1978	14553	171,505	81,307
1979	13094	122,049	95,143
1980	21693	99,569	89,284
1981	23035	157,179	174,379
1982	26819	113,002	126,539
1983	28952	150,861	153,555

A

Lobster district	Year	Number of sale slips	Average meat yield/slip(kg)
7C	1981	584	39.4
	1982	474	56.6
	1983	409	70.8
8	1981	4009	39.2
	1982	2580	43.8
	1983	3023	49.9
7b1	1981	3471	46.6
	1982	2563	53.2
	1983	4397	39.7

Table 7: Effort (number of days fished) and average meat yield (kg per day)
A- in the three southern Gulf lobster districts
B- in major statistical subdistricts of district 8
C- in major statistical subdistricts of district 7b1.

(Source - Statistics Branch/Halifax)

B

Statist sub-district	Year	Number of sale slips	Average meat yield/slip(kg)
76	1981	565	47
	1982	316	57
	1983	419	75
80	1981	1753	35
	1982	1181	40
	1983	654	35
82	1981	868	46
	1982	735	42
	1983	1160	51

C

Statist sub-district	Year	Number of sale slips	Average meat yield/slip(kg)
11	1981	1085	40
	1982	802	34
	1983	816	33
86	1981	570	55
	1982	578	63
	1983	666	64
87	1981	1566	53
	1982	944	59
	1983	2009	40

Table 8 - Number of prerecruits fished per meter of lined drag per hour.

	1982	1983
Nepisiguit	39.1	17.4
Miscou	30.1	9.6
Shippagan	22.5	7.9
Richibucto	25.8	18.4
Cape Tormentine	6.4	7.4
Pugwash	*	2.2
Pictou	18.8	19.9

* No data available

Table - Estimated number of licensed and active fishermen in 1981, 1982 and 1983. (Average number of days fished per active license are given for district 8 in 1982 and 1983)

Lobster District	Sub-district	1981(2) Licenses Issued	1981(2) Active Licenses	1982 Licenses Issued	1982 Active Licenses	1982 Average no. of fishing days	1983 Licenses Issued	1983 Active Licenses	1983 Average no. of fishing days (1)
7C	63	7	*	7	4		5	4	
	64	6	*	6	7		6	5	
	65	22	*	9	0		7	2	
	66	3	*	4	2		5	3	
	67	1	*	1	0		-	-	
	68	28	*	26	20		27	21	
	69	0	*	10	8		11	10	
	70	17	*	9	8		11	9	
8	75	13	2	11	10	24.0	13	11	34.5
	76	30	30	33	33	23.3	39	33	55.0
	77	14	0	12	9	20.2	12	10	28.0
	78	18	12	17	5	25.0	15	6	22.7
	80A	66	66	64	59	33.4	66	59	40.7
	82A	31	11	31	30		31	20	60.0
	83	12	0	12	10		12	10	40.0
7b1	2	2	0	2	0		3	2	
	3	5	0	5	0		5	5	
	10	3	0	3	3		7	7	
	11	62	62	62	52		81	69	
	12	8	5	8	0				
	13	27	22	26	4		25	14	
	45	1	0	1	0		0	0	
	46	6	0	6	6		8	8	
	85	6	0	6	0		*	*	
	86	28	27	28	0		*	*	
	87	160	122	160	110		207	170	
	88	83	13	83	9		6	2	

(1) Preliminary data (2) Data from Jamieson et al. 1981 * No data available

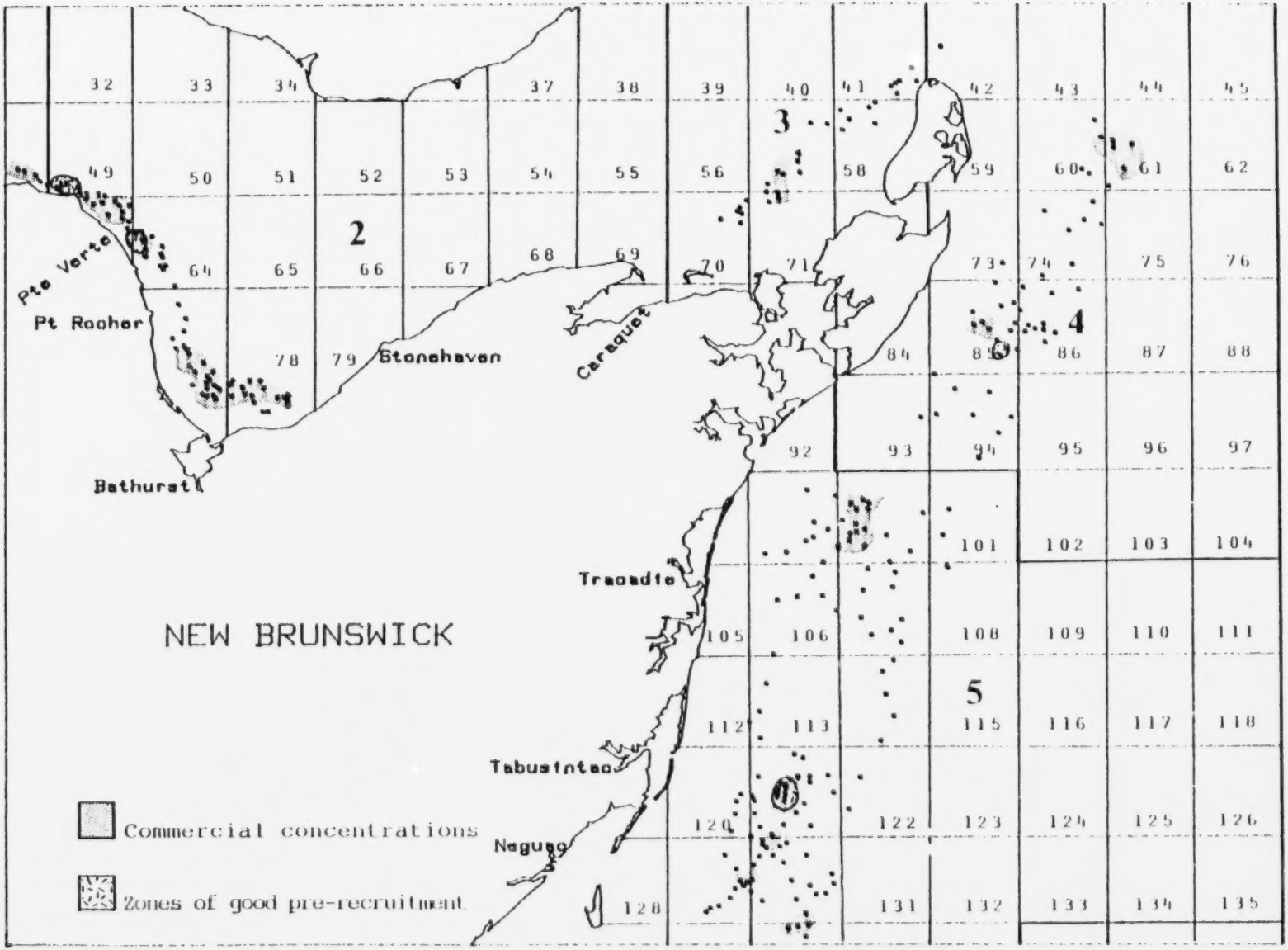


Fig. 1 - Survey stations in areas surveyed in district 8 and zones of commercial concentrations and good prerecruitmer ' large numbers correspond to survey are numbers as quoted in the text)
• Survey stations

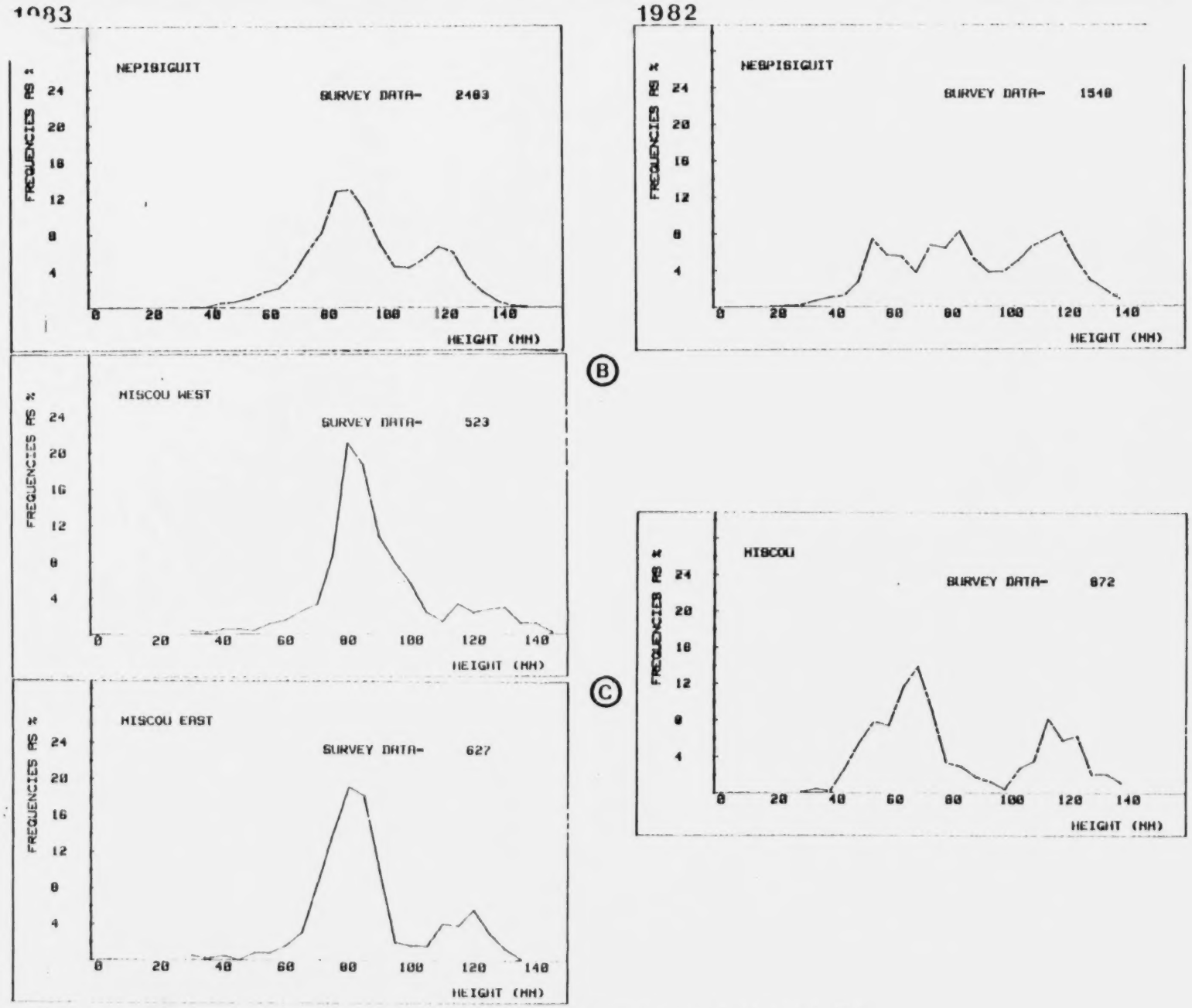


Fig. 2 - Relative size frequency distributions in survey areas of district 7b1
——— Commercial catches
----- Survey catches

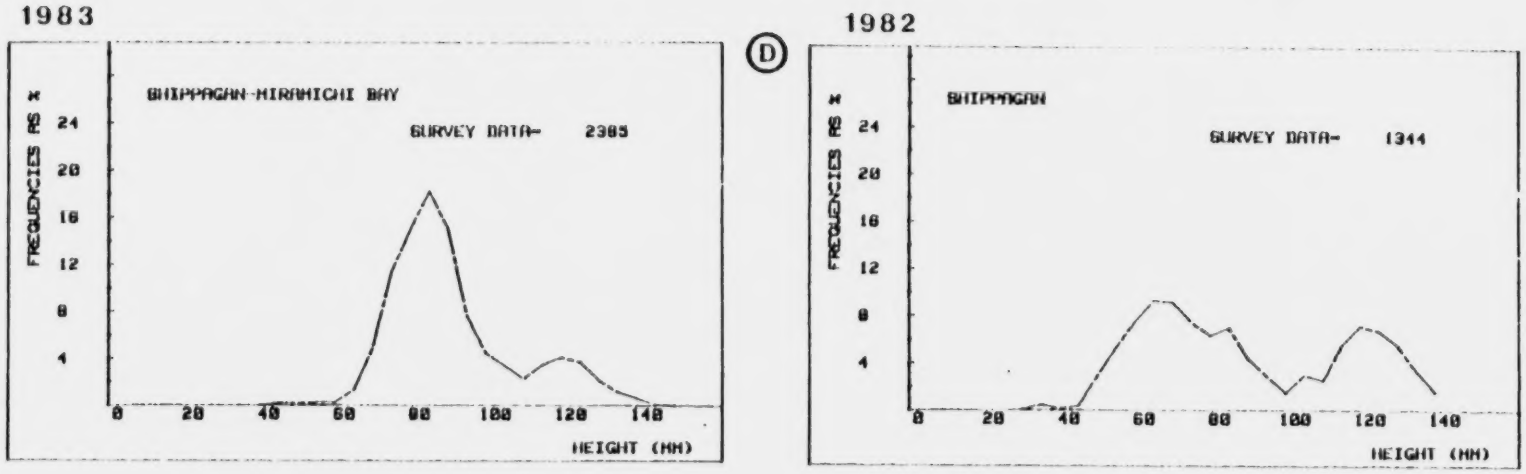


Fig. 2 - (continued)

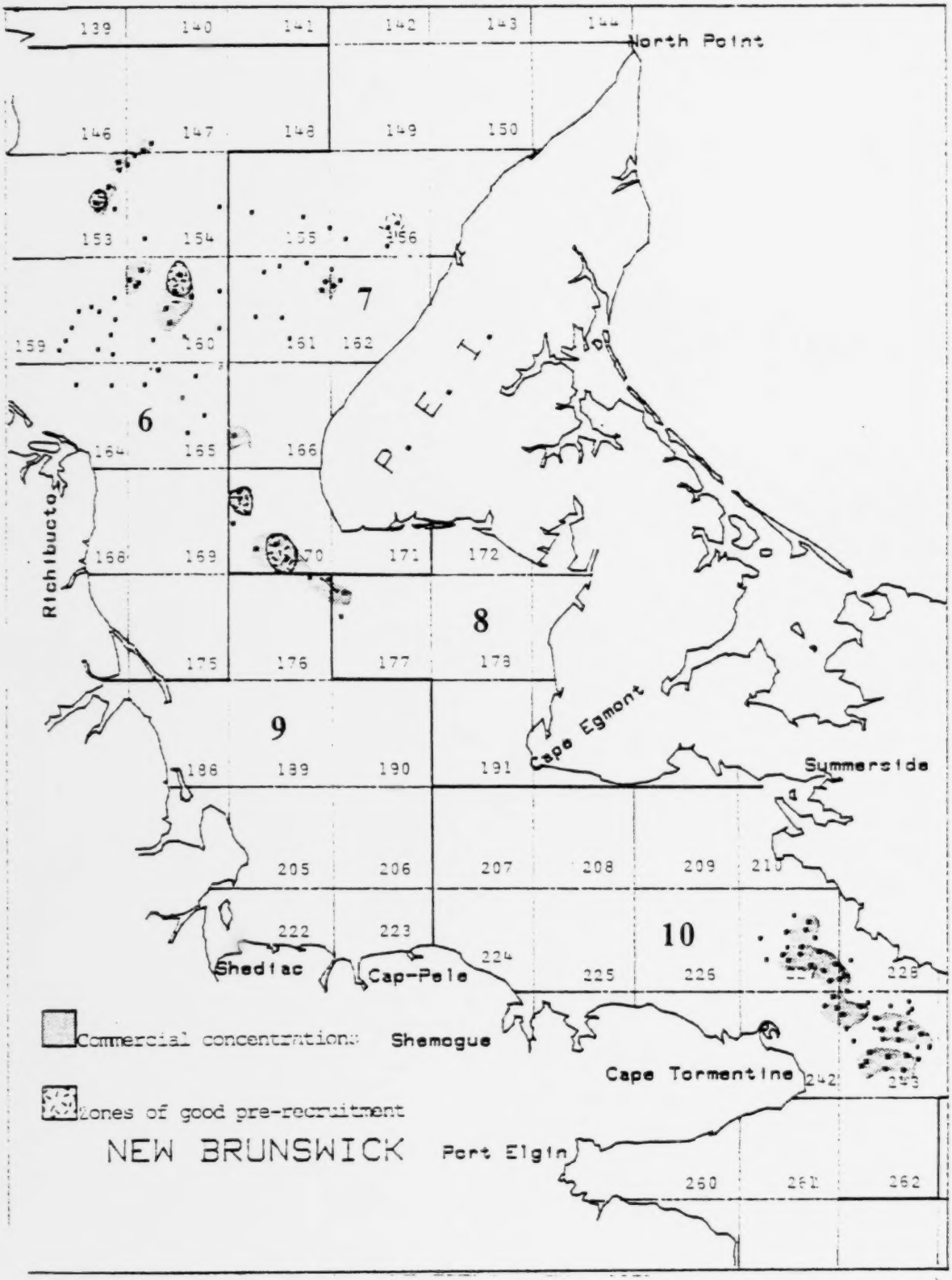


Fig. 3 - Survey stations in areas surveyed in district 8 and zones of commercial concentrations and good pre-recruitment (large numbers correspond to survey area numbers as quoted in the text)
• Survey stations

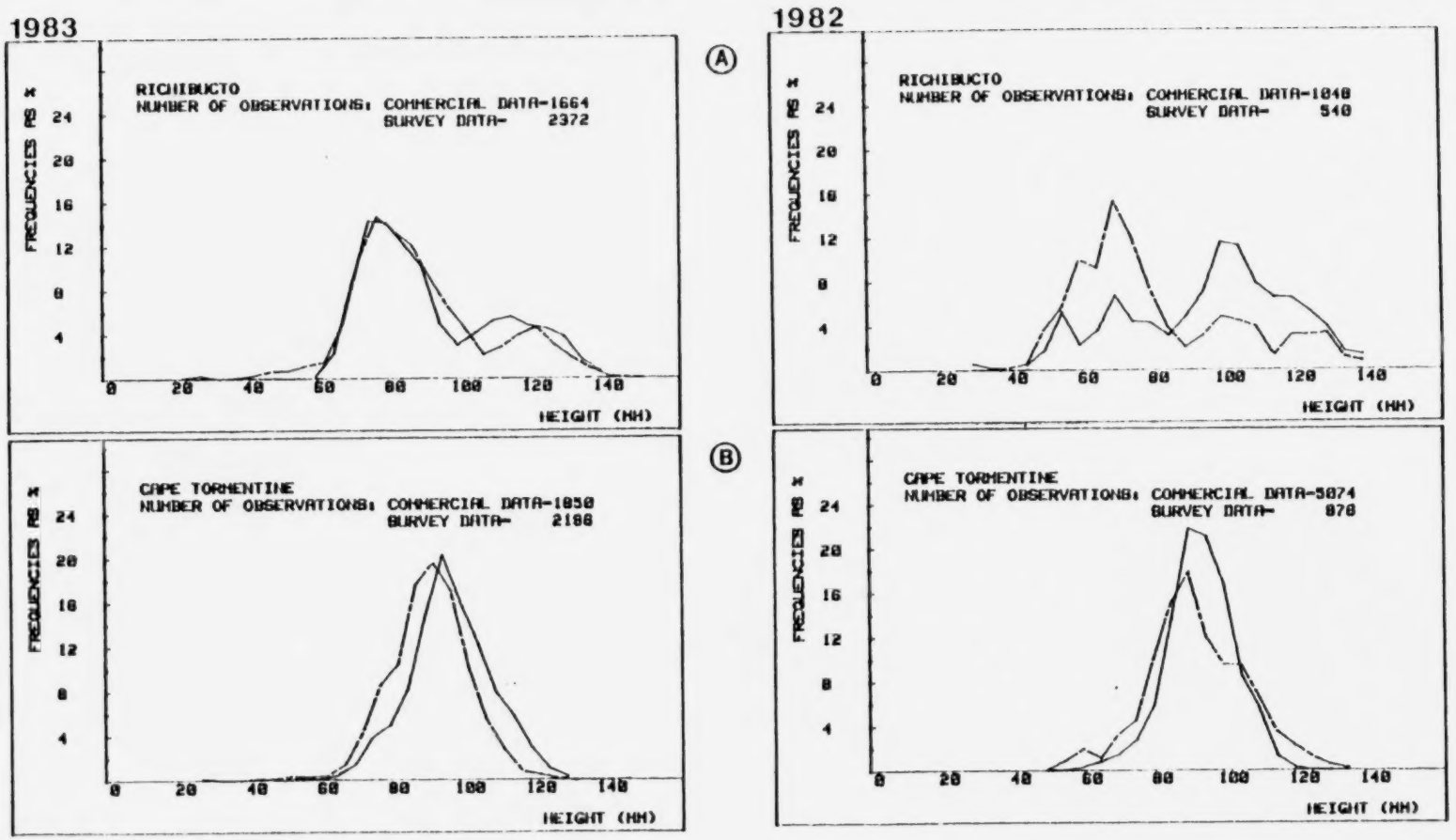


Fig. 4 - Relative size frequency distributions in survey areas of district 8 for 1982 and 1983

——— Commercial catches

------- Survey catches

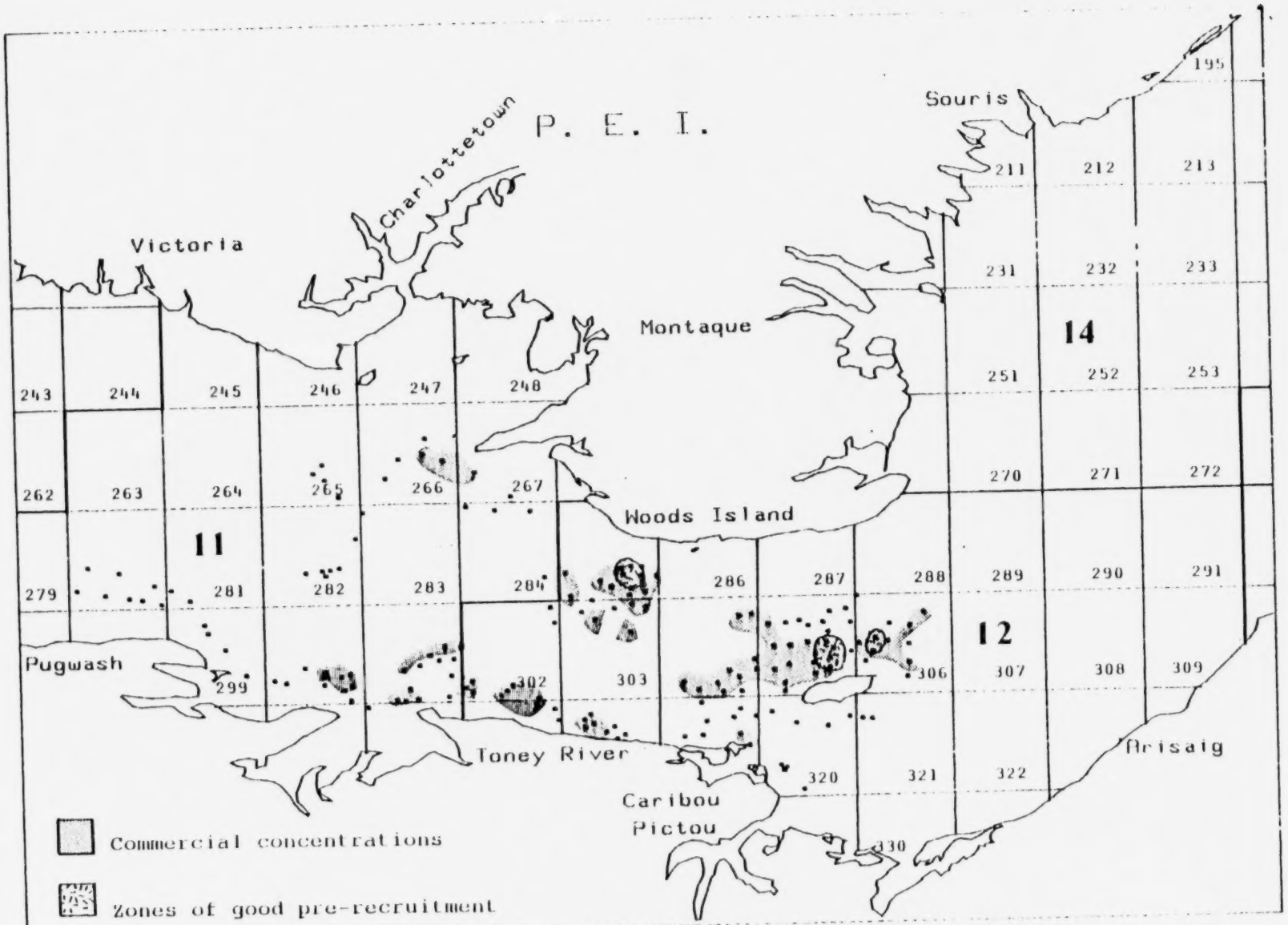


Fig. 5 - Survey stations in areas surveyed in district 7b1 and zones of commercial concentrations and good pre-recruitment (large numbers correspond to survey area numbers as quoted in the text)

• Survey stations

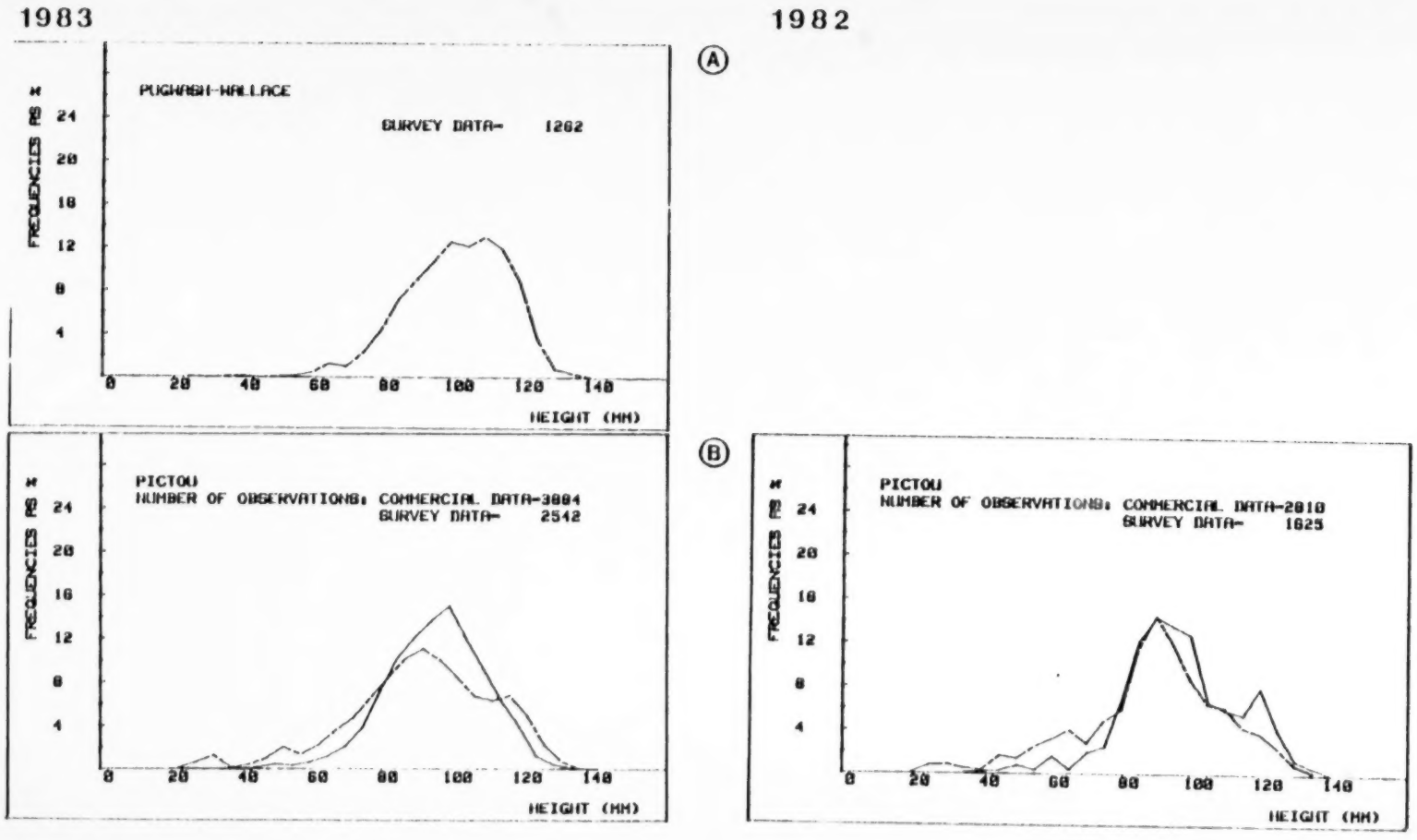
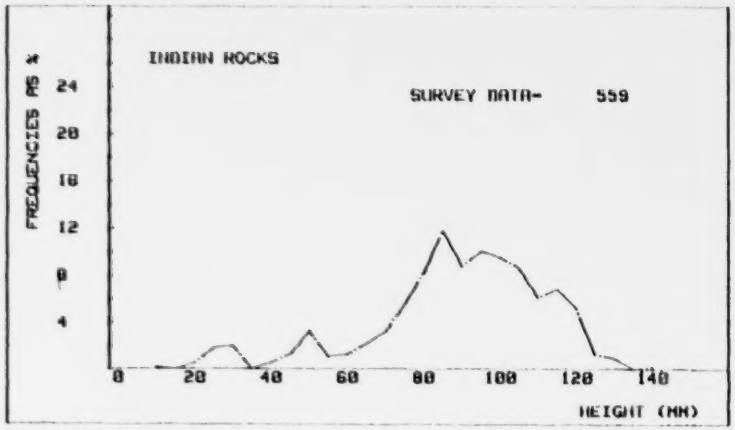


Fig. 6 - Relative size frequency distributions in survey areas of district 7c
——— Commercial catches
– – – – Survey catches



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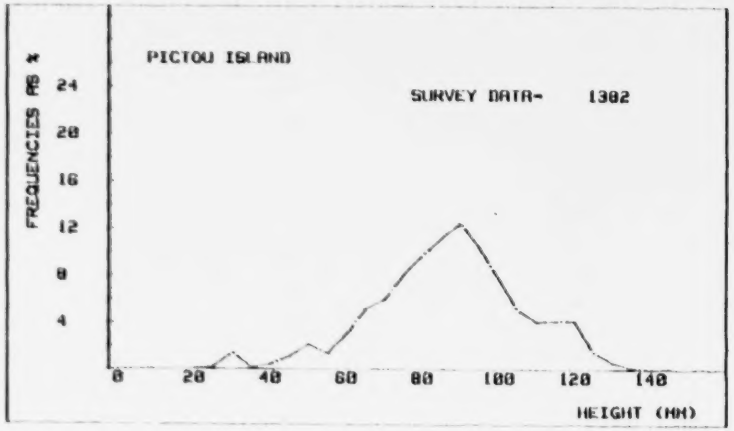

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Fig. 6 - (continued)

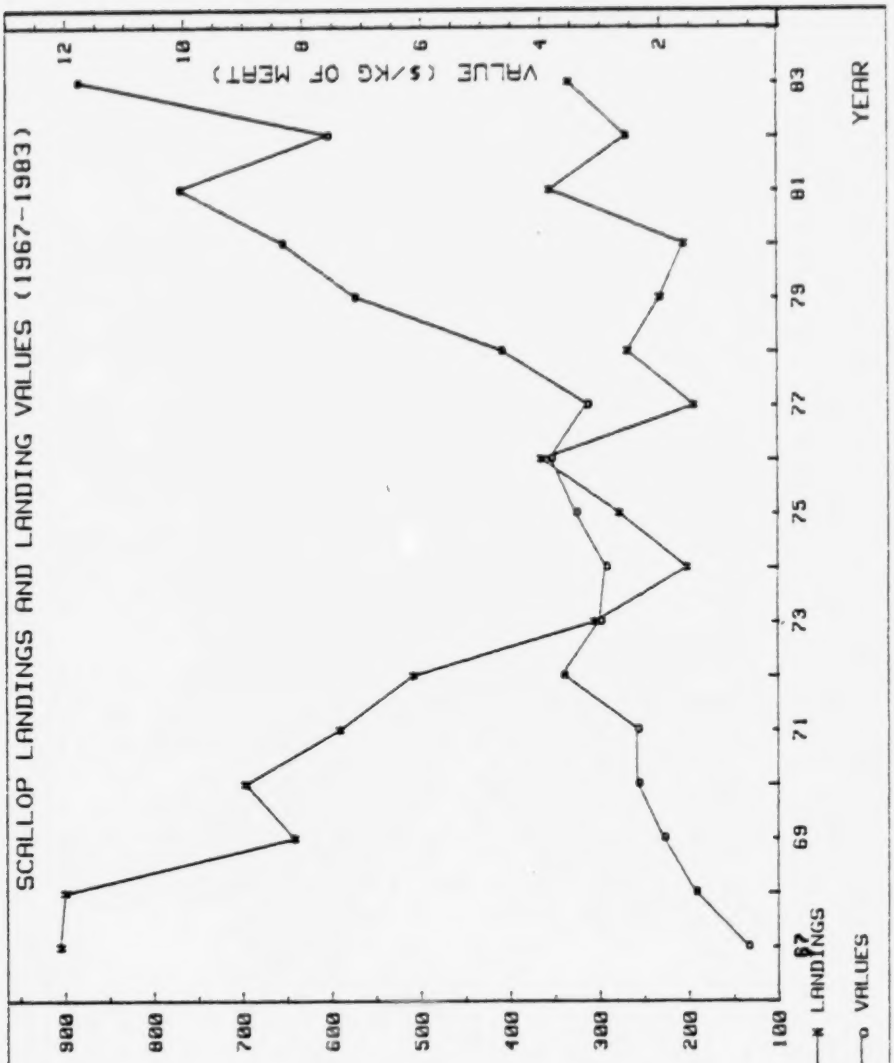


Fig. 7 - Yearly evolution (1967-1983) of landings and landing values in the three districts of the Southern Gulf.

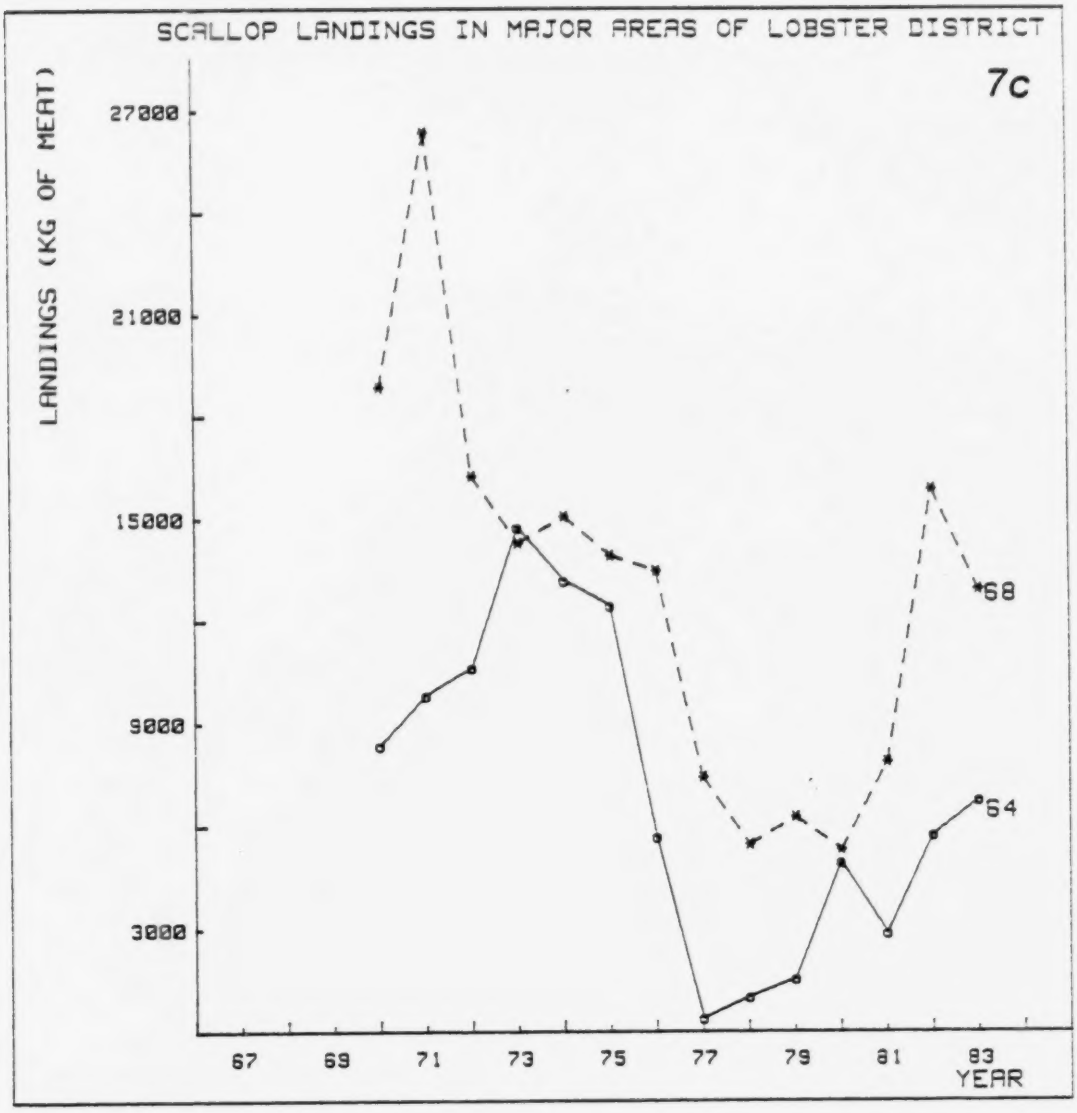


Fig. 8A - Yearly evolution (1967-1983) of scallop landings in major statistical sub-districts in district 7c.

64 - Nepisiguit
68 - Val Comeau

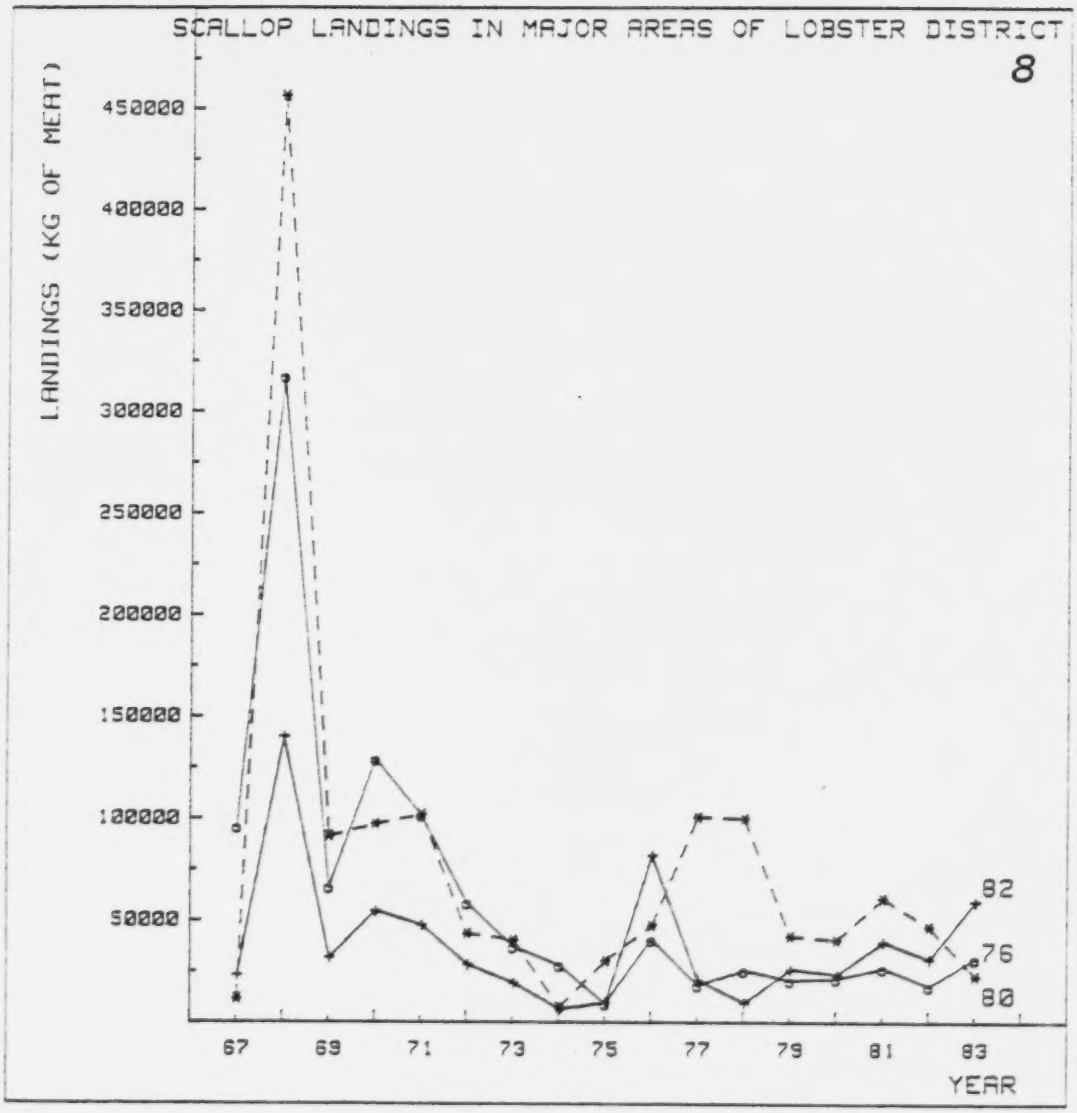


Fig. 8B - Yearly evolution (1967-1983) of scallop landings in major statistical sub-districts in district 8.

76 - Richibucto
80 - Cape Tormentine
82 - Miminegash

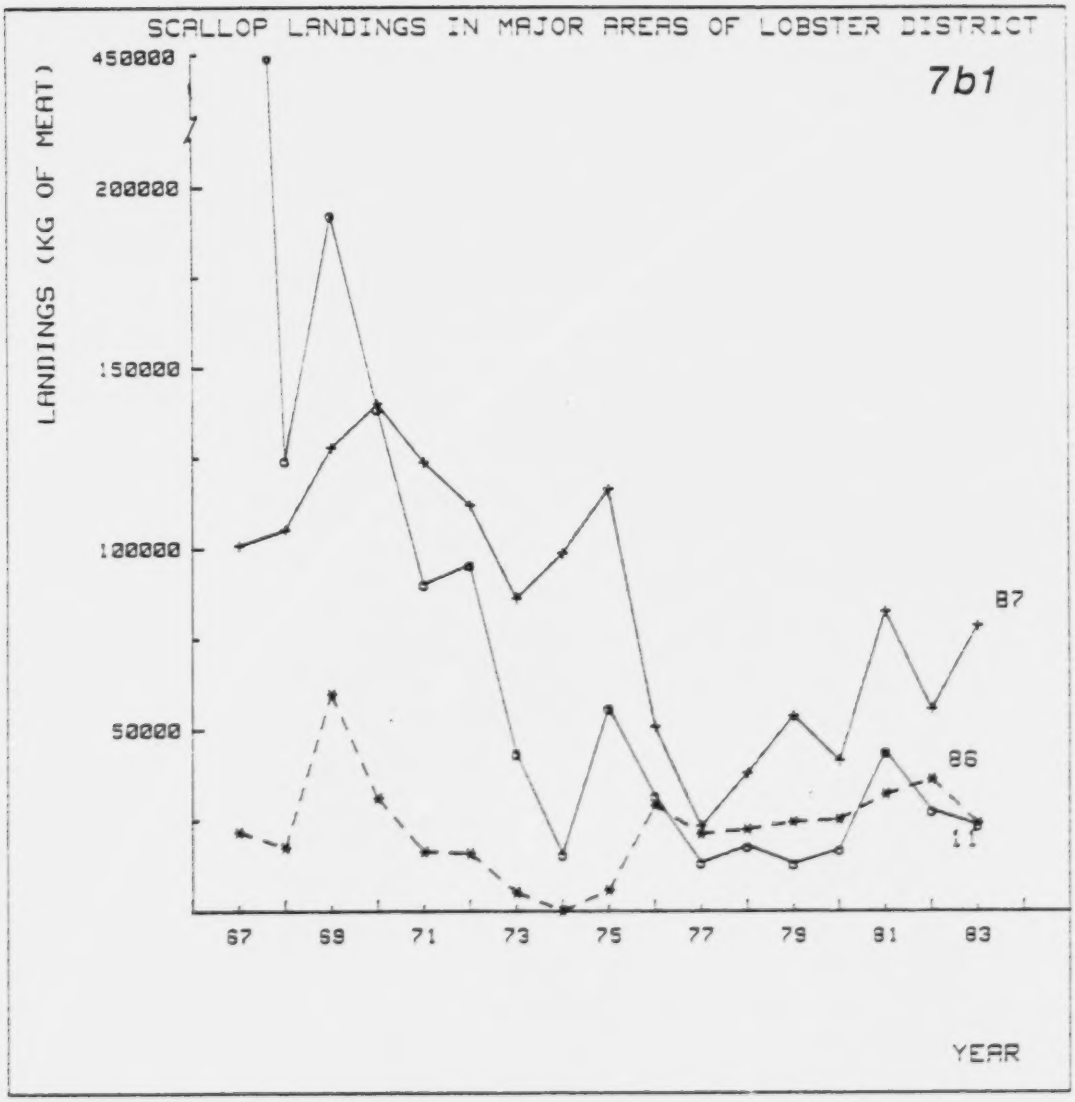


Fig. 8C - Yearly evolution (1967-1983) of scallop landings in major statistical sub-districts in district 7b1.

11 - Pictou
86 - Woods Island
87 - Boughton Island

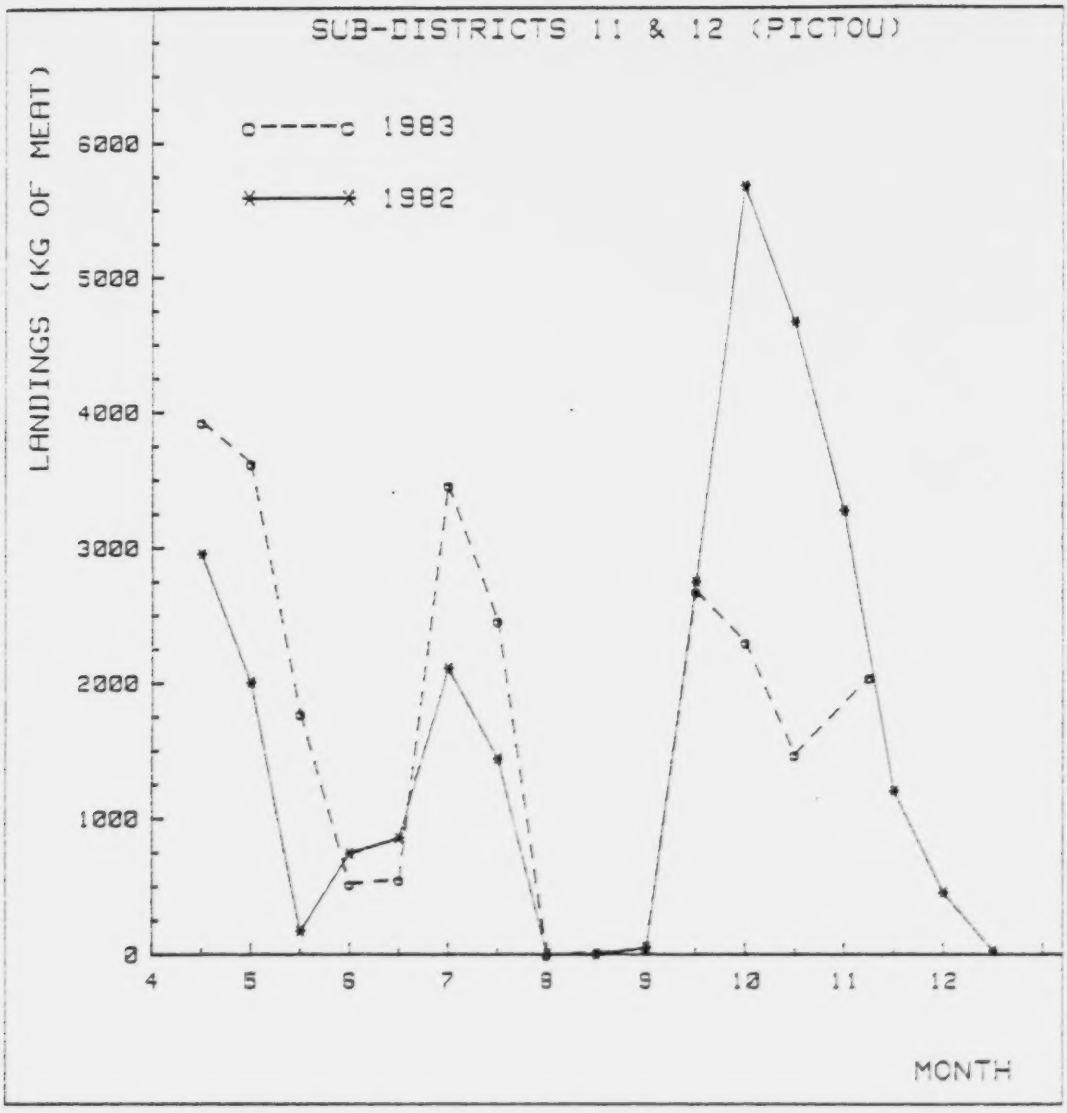


Fig. 9 - Landing by half month in sub-districts 11 and 12 (Pictou area)

Appendix I - List of boats chartered for 1983 survey program.

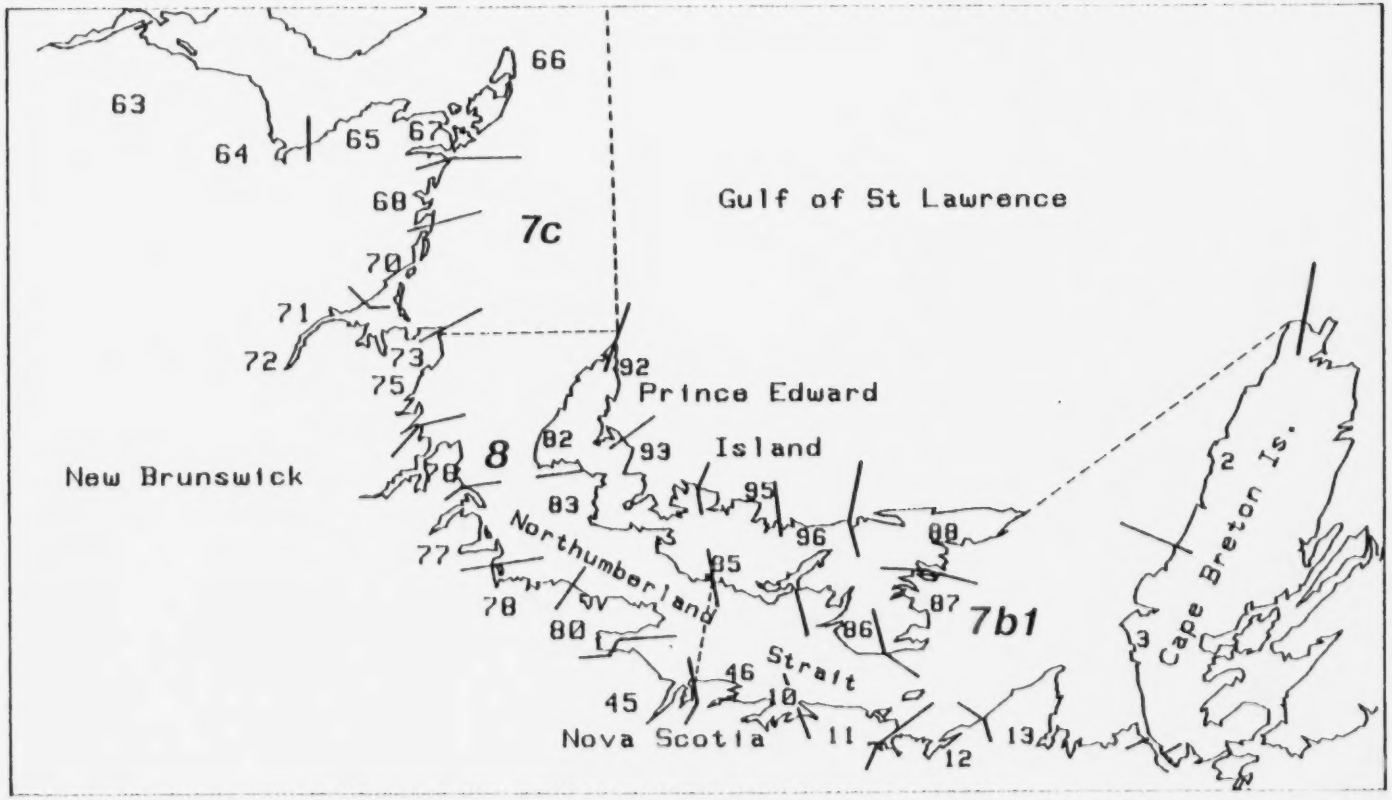
AREA	FISHERMAN	VESSEL	OVERALL LENGTH (ft)	TYPE	DATE	NO. OF TOWS
Nepisiquit	E. Lagacé	Louveteau	40	A-frame	10-12 August	79
Miscou	B. Carll	B. Carll	45	Side	21-28 August	80
Shippagan/ Miramichi	P. Breau	Emmanuel B.	43	A-frame	15-22 August	126
Richibucto	A. Vautour	Miss Gisèle	42.5	Side	20-24 June	76
Cape Tormentine	D.F.O. vessel	1B-1284	43	A-frame	7-11 July	52
Pugwash	H.W. Langille	Elite	40	A-frame	24-29 August	82
Pictou	H.W. Langille	Elite	40	A-frame	31 August-2Sept. 11-12 October	91
						586

Appendix II - Shell height/meat weight relationship as calculated from 1982 biometrical data and meat count for 1983 calculated from this relationship.

Area	Meat Weight / Shell Height Relationship	1983 Meat count/500g		Meat count/1lb	
		Survey	Comm.	Survey	Comm.
Nepisiquit	$(1.286 \times 10^{-5}) X^{3.020}$ (R=0.979)	40.35	-	36.64	-
Miscou		38.80*	-	35.23*	-
Shippagan/Miramichi	$(1.218 \times 10^{-5}) X^{3.088}$ (R=0.952)	37.25	-	33.82	-
Richibucto	$(3.215 \times 10^{-5}) X^{2.880}$ (R=0.967)	37.15	34.58	33.74	31.40
Egmont Bay	$(1.659 \times 10^{-5}) X^{2.997}$ (R=0.927)				
Miminegash	$(7.832 \times 10^{-5}) X^{3.174}$ (R=0.945)				
Boutouche	$(2.486 \times 10^{-5}) X^{2.933}$ (R=0.933)				
Cape Tormentine	$(2.777 \times 10^{-5}) X^{2.885}$ (R=0.825)	41.08	40.77	37.30	37.02
Pugwash		40.54*	-	36.81*	
Pictou	$(3.731 \times 10^{-5}) X^{2.814}$ (R=0.935)	39.99	36.88	36.31	34.49
Souris/Montague	$(2.660 \times 10^{-5}) X^{2.843}$ (R=0.956)				
George's Bay	$(5.289 \times 10^{-5}) X^{3.157}$ (R=0.970)	-	55.86	-	50.72

* result extrapolated from adjacent areas

Appendix III - Map of the Southern Gulf of St. Lawrence showing lobster districts (large numbers) and statistical sub-districts (small numbers).



Appendix IV - Detailed results by explored square for each area of survey.

AREA	SQUARE NO.	NUMBER OF TOWS	NUMBER OF INDIVIDUALS >70mm	NUMBER OF INDIVIDUALS < 70mm	C.P.U.E. kg/m/h	C.P.U.E. lb/ft/
Nepisiguit	48	4	155	16	1.23	0.82
	49	14	445	90	1.10	0.74
	63	4	170	15	1.42	0.95
	64	14	323	59	0.89	0.60
	77	19	415	13	0.78	0.53
	78	7	212	14	1.09	0.73
	89	5	186	11	1.30	0.87
	90	12	342	17	1.03	0.69
	Total	79	2248	235	1.02	0.68
Miscou	41	7	23	0	0.12	0.08
	42	1	0	0	-	-
	57	10	446	44	1.68	1.13
	58	5	40	1	0.30	0.20
	60	4	68	1	0.61	0.41
	61	5	368	30	2.67	1.79
	70	6	6	1	0.04	0.03
	71	2	66	6	1.18	0.79
	73	2	10	3	0.19	0.13
	74	8	43	8	0.19	0.13
	85	13	336	34	0.95	0.64
	86	9	57	6	0.24	0.16
	93	1	10	0	0.34	0.23
	94	7	14	3	0.07	0.05
	Total	80	1487	137	0.68	0.46
Shippagan/ Miramichi Bay	99	9	102	2	0.50	0.33
	100	19	545	33	1.11	0.75
	101	3	3	0	-	-
	106	5	0	0	-	-
	107	10	16	0	-	-
	113	6	24	0	0.16	0.11
	114	4	5	0	-	-
	120	4	12	0	0.12	0.08
	121	29	1025	120	1.40	0.94
	122	2	2	0	-	-
	129	10	130	4	0.52	0.35
	130	22	287	12	0.54	0.36
	139	3	60	3	0.79	0.53
	Total	126	2211	174	0.70	0.47

Appendix IV (continued)

AREA	SQUARE NO.	NUMBER OF TOWS	NUMBER OF INDIVIDUALS > 70mm	NUMBER OF INDIVIDUALS < 70mm	C.P.U.E. kg/m/h	C.P.U.E. lb/ft/h
Richibucto	147	3	35	3	0.45	0.30
	153	8	312	19	1.42	0.95
	154	2	6	0	0.12	0.08
	155	3	21	2	0.27	0.18
	156	4	357	34	3.34	2.24
	159	12	116	6	0.38	0.26
	160	12	510	86	1.46	0.98
	161	10	181	8	0.66	0.44
	162	1	18	2	0.57	0.38
	164	2	8	0	0.14	0.09
	165	7	6	0	0.03	0.02
	166	1	1	1	0.03	0.02
	170	9	442	124	1.87	1.26
	177	2	65	9	1.15	0.77
	Total	76	2078	294	1.01	0.68
Cape Tormentine	227	20	897	39	1.50	1.01
	228	2	44	1	0.90	0.61
	242	5	327	10	2.14	1.44
	243	25	841	37	1.17	0.78
	Total	52	2109	87	1.39	0.93
Pugwash	265	4	13	0	0.13	0.01
	266	5	47	0	0.33	0.22
	267	3	18	0	0.22	0.15
	280	8	5	0	0.02	0.02
	281	2	10	0	0.18	0.12
	282	6	67	4	0.42	0.28
	283	1	23	0	1.12	0.75
	284	3	14	0	0.17	0.11
	299	4	7	0	0.06	0.04
	300	13	198	9	0.54	0.37
	301	13	328	19	0.92	0.62
	302	9	265	7	1.07	0.72
	317	3	38	0	0.46	0.31
	318	8	188	2	0.83	0.56
	Total	82	1221	41	0.54	0.36

Appendix IV (continued)

AREA	SQUARE NO.	NUMBER OF TOWS	NUMBER OF INDIVIDUALS > 70mm	NUMBER OF INDIVIDUALS < 70mm	C.P.U.E. kg/m/h	C.P.U.E. lb/ft/.
Pictou	284	1	18	2	0.66	0.45
	285	16	442	83	0.78	0.53
	286	1	44	7	1.08	0.73
	288	1	4	0	0.30	0.20
	302	2	12	0	0.22	0.15
	303	5	128	11	0.90	0.60
	304	8	236	29	1.04	0.70
	305	28	854	189	1.04	0.70
	306	11	243	43	0.81	0.54
	319	8	106	6	0.47	0.32
	320	8	60	1	0.28	0.19
	321	2	23	1	0.40	0.27
	Total	91	2170	372	0.81	0.54